Soft Tissues & Pink Esthetics in Implant Therapy

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This book is dedicated to the memory of Giuseppe Cardaropoli: a brother, friend, and colleague; a person who always believed in the importance of scientific research; and an author whose publications are an international benchmark in the implant literature.

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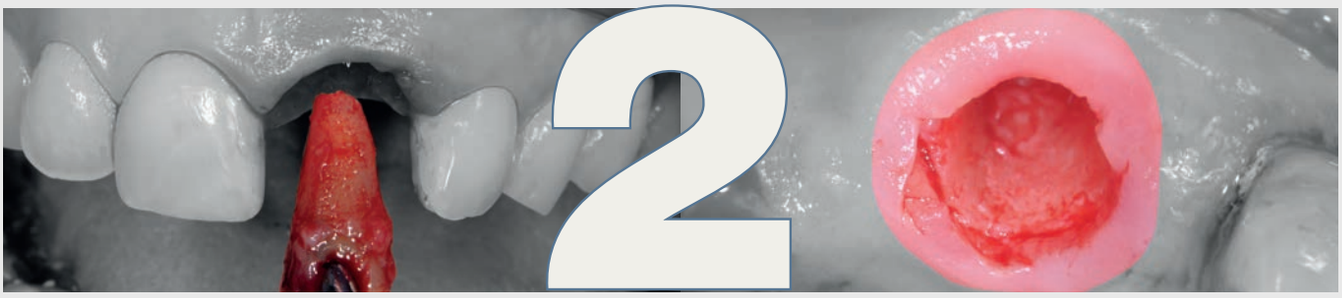

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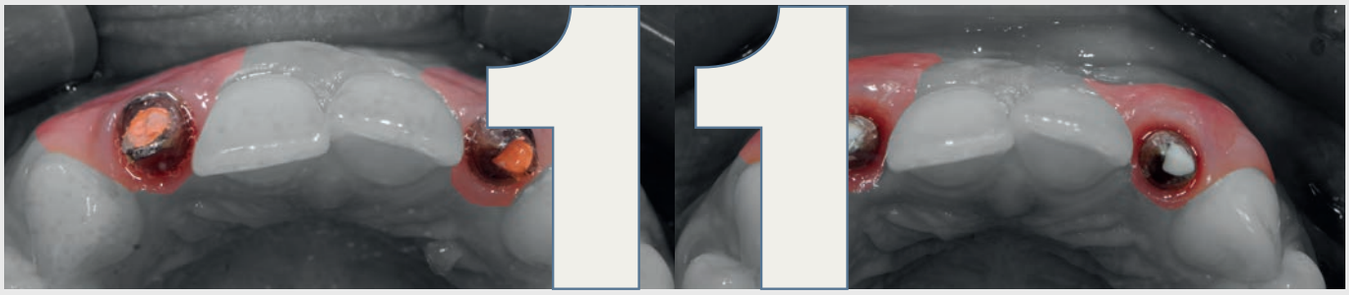

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Clinical Case Studies

Forewords

This work reflects the surgical and treatment procedures employed by two highly experienced clinicians. Each chapter provides readers with information on how and why to treat their patients in order to achieve and maintain an optimum esthetic outcome with implant therapy.

The diagnosis and assessment of the quantity and quality of hard and soft tissues suitable for implant placement are discussed with particular attention to the expected outcome of therapy. Placement of implants immediately after extraction can be challenging because the socket healing process is always critical. In such situations, it is crucial to assess buccal cortical bone integrity and soft tissue thickness and consider alternative options if acute infections are present. Other considerations include the use of a grafting technique to fill the gap between bone and implant and the choice of suitable biomaterials.

When specifically indicated, socket preservation techniques can be applied at the same time. This means selecting the most appropriate biomaterials, barrier membranes, and surgical techniques. In addition, soft tissue augmentation procedures are crucial when deficiencies have to be managed during implant placement to build up the site or when conditioning peri-implant tissue to receive a prosthesis. On these specific topics, Dr Cardaropoli—whom I have known since he was a university student—has made a substantial contribution to the international literature, and his works are referred to throughout the book.

This work is a must for anyone performing implant dentistry. The book offers a clear, multidisciplinary approach to dealing with implants in the esthetic zone and a thorough description of the procedures necessary for a successful long-term outcome. Every dental practice should make room on its bookshelves for this volume.

Myron Nevins, DDS
Associate Professor
Harvard School of Dental Medicine

I read this book with great interest and even some pride. I used to teach Dr Casentini, and he has achieved more in his career than any of my other students. After studying oral surgery under my guidance, he expanded his knowledge into periodontology, implant dentistry, and prosthetics. His approach is extremely constructive, and he has always combined intellectual curiosity with indubitable clinical skills and great natural talent. Last but not least, he is a remarkable teacher who is invited all over the world to share his knowledge.

The subject of this book, peri-implant soft tissue management, is very topical and has grown considerably in recent years to become the main pillar of successful prosthetic rehabilitation using implants.

Both authors are expert and creative clinicians who have contributed to the development of peri-implant soft tissue management techniques and built up 20 years of experience in the field. I was particularly struck by the book's innovative structure: Each chapter is dedicated to a specific topic with an opening question-and-answer section that serves the twofold purpose of providing the scientific bases and answering clinicians' frequently asked questions. A long series of lavishly illustrated case studies in the second part of each chapter explores the different clinical ramifications of the topic in question, showing various clinical situations in which readers will be able to identify cases that are similar to ones they have personally encountered.

Some of the cases Dr Casentini discusses stem from our own partnership, which dates back more than 20 years, and I am happy to have been able to contribute our joint case histories to the book. Although I was his teacher, I am proud to say that he has been a source of ongoing professional enrichment for me and has expanded my dental outlook in the broadest sense.

I am sure this book breaks new ground in terms of its structure and content. It is destined to continue providing clinicians with a very useful reference in the long term. I think it is indispensable reading for the modern dental practitioner, and I am certain that it will not disappoint its many readers.

Matteo Chiapasco, DDS, MD
Professor, Head of Oral Surgery
University of Milan

Visiting Associate Professor
Loma Linda University School of Dentistry

Preface

Why a guide to soft tissues and pink esthetics in implant therapy?

Osseointegration, ie, direct contact between the implant and surrounding bone tissue, must still be considered a basic requirement of implant therapy but is no longer the only objective to be achieved in oral implantology. Today, optimal integration of the prosthetic restoration with the surrounding soft tissues must be considered a main criterion for successful implant treatment. "Pink esthetics" has become the holy grail of modern implant therapy. Once sufficient hard tissue volume has been built up, a series of techniques must be implemented to maintain, augment, condition, and replicate the soft tissues that will surround the future implant-supported restorations. Only in this way will it be possible to achieve satisfactory esthetic integration of hard issues with their surrounding soft tissues, ie, crowns that look like natural teeth and are not immediately recognizable as crowns on implants.

Why a book with questions, answers, and clinical case studies?

Over many years of training, during innumerable courses and lectures, we realized that the most important part of contemporary teaching is responding to our colleagues' questions and needs and explaining treatment strategies by presenting clinical case examples.

This book, which can be considered a distillation of 20 years of clinical and teaching experience, is based on this principle. Each chapter begins with strategically chosen frequently asked questions and their answers, providing a framework for the topic covered, describing current scientific findings, and setting out guidelines for a given technique. The next section offers step-by-step analysis of clinical cases, providing detailed examples of surgical techniques applied to specific treatment options.

When selecting clinical cases, we tried to represent the different ramifications of a topic, explaining the surgical and prosthetic procedures applied to a wide range of different therapeutic needs. The range of clinical situations explored is sufficiently broad to allow readers to identify clinical cases similar to those they deal with routinely. Our clinical activities have continued along parallel tracks for many years and find a natural meeting point in our common quest for the best therapeutic option, always making the patient the focus of our decision making. Each of us contributed our own personal clinical and professional experiences to the text, but they are framed by a common working philosophy designed to enhance the reader's learning experience.

We are sure that the systematic organization of the topics covered, the wealth of photographs, and the clear descriptions will help generate a general picture and be a useful training tool for our colleagues.

We hope we will see more clinical cases treated in a predictable manner. The true value of our professional lives is not reflected by a single action, whose success can depend on chance, but by the sum of all our actions. Randomness and chance are not equal to routine practice. It is wrong to claim success based on a chance positive result, because predictability means knowing how to achieve that result systematically. The only way to do this is to know exactly how and why this result was achieved. Without evidence-based scientific and objective knowledge, we cannot formulate proper treatment plans and achieve optimal, stable results over time.

Acknowledgments

First and foremost, my sincere thanks go to my wife, Lorena. She is my life partner; without her advice, support, and understanding, I would not be what I am or be able to do what I do.

Thank you to my children, Luca and Alessia. They are my life and my strength.

Special thanks to my parents—Annamaria and Tito. I am grateful for the way they brought me up and what they taught me and passed on to me: honesty and fairness, first and foremost.

Thank you to my grandparents. They are my roots. They have passed on, but I am sure that they are watching me from above.

Thank you to all the practice staff: Linda, Francesca, Melissa, and Sonia.

I am bound to thank my mentor, Ron Nevins, who has always been a point of reference and source of inspiration. He is an unparalleled clinician and researcher.

Thanks to all the friends and colleagues who have supported and appreciated my teaching activities over the years. They are the reason for my ongoing quest for improvement.

Thanks to the Dentalanze dental laboratory in Castagnole delle Lanze, Italy.

Unless otherwise specified, the cases I treated surgically were managed on an interdisciplinary basis by the PRoEd—Institute for Professional Education in Dentistry—team, and I would like to thank them all: Drs Alessandro Roffredo, Lorenzo Tamagnone, Andrea De Maria, Lorena Gaveglio, and Monica Ravera.

Daniele Cardaropoli

First of all, I would like to thank my family—my wife, Irene, and my children, Zeno and Sveva—for the great support they give me every day. I inevitably stole time from them to write this book, and I hope they will understand.

Thank you to my father, Augusto Casentini, and my mother, Silvana De Luca: parents, colleagues, and teachers by profession and above all by their professional ethics. Thank you for teaching me to strive to do my best for my patients every day.

Thanks to Nicolò Gruden, who is practically my second father and a very experienced clinician.

Heartfelt thanks to my teacher, Matteo Chiapasco, the most experienced, sophisticated, and creative surgeon that I've ever met and one of the most cultured people I have had the good fortune to know. Thank you for our fruitful partnership and for igniting my passion for teaching.

Thanks to Claudio Gatti for launching me as a speaker nearly 25 years ago.

Thanks to the team at my practice and the Narcodont Centre, who help me pursue excellence every day; thanks in particular to Nicola Balduzzi, Fabio Quarta, and Luca Pizzoni, who are fantastic colleagues and friends.

Thanks to my dental technician friends for everything they have taught me and for the outstanding results we have achieved together over the years.

A special mention to all the colleagues and dental technicians who contributed to each case in the case study section: warm thanks for all your hard work!

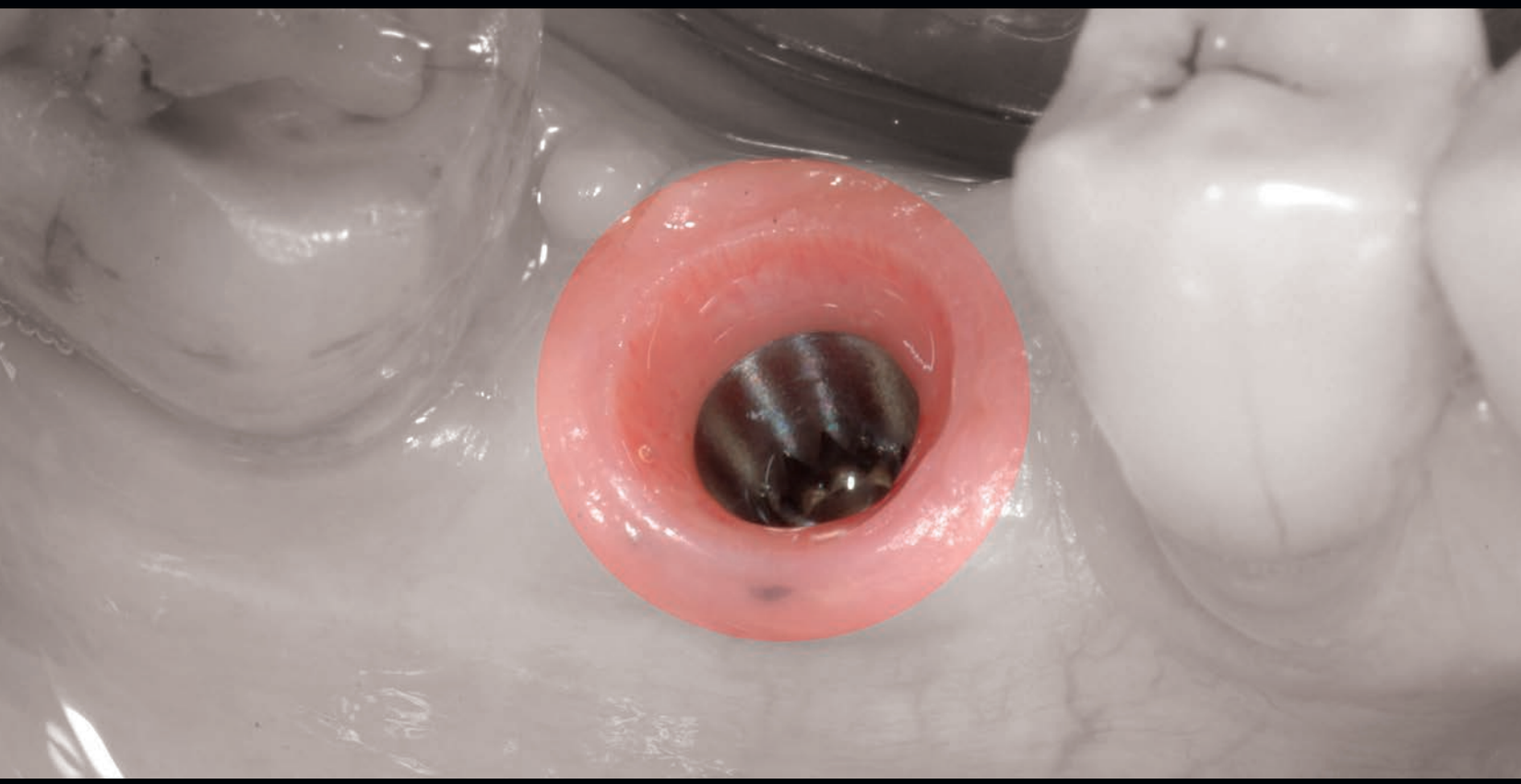
Paolo Casentini

We are what we repeatedly do.
Excellence, then, is not
an act, but a habit.

Aristotle

one

Quality and Quantity of Peri-implant Soft Tissue



Questions:

1. What is the biologic significance of peri-implant soft tissue?
2. How does soft tissue heal around an implant?
3. What are the histologic characteristics of peri-implant soft tissues?
4. What are the main differences between a natural tooth and an implant at the supracrestal level?
5. Is biologic width present around implants?
6. What are the clinical implications of forming biologic width around implants?
7. What is meant by *platform switching* and what is its biologic significance?
8. What are the dynamics of soft tissue healing around immediate implants?
9. What is the role of keratinized tissues around implants?

1 What is the biologic significance of peri-implant soft tissue?

The creation of a soft tissue barrier around a dental implant at the point where it emerges into the oral cavity is an important stage in the process of rendering the implant functional and ensuring the esthetic integration of the implant-supported prosthetic restoration (Fig 1-1). Maintaining this seal in a condition of health is critical to the function and long-term prognosis of the implant. The ultimate purpose of the peri-implant soft tissue seal is to protect the underlying bond between the implant and bone tissue created through the osseointegration process.

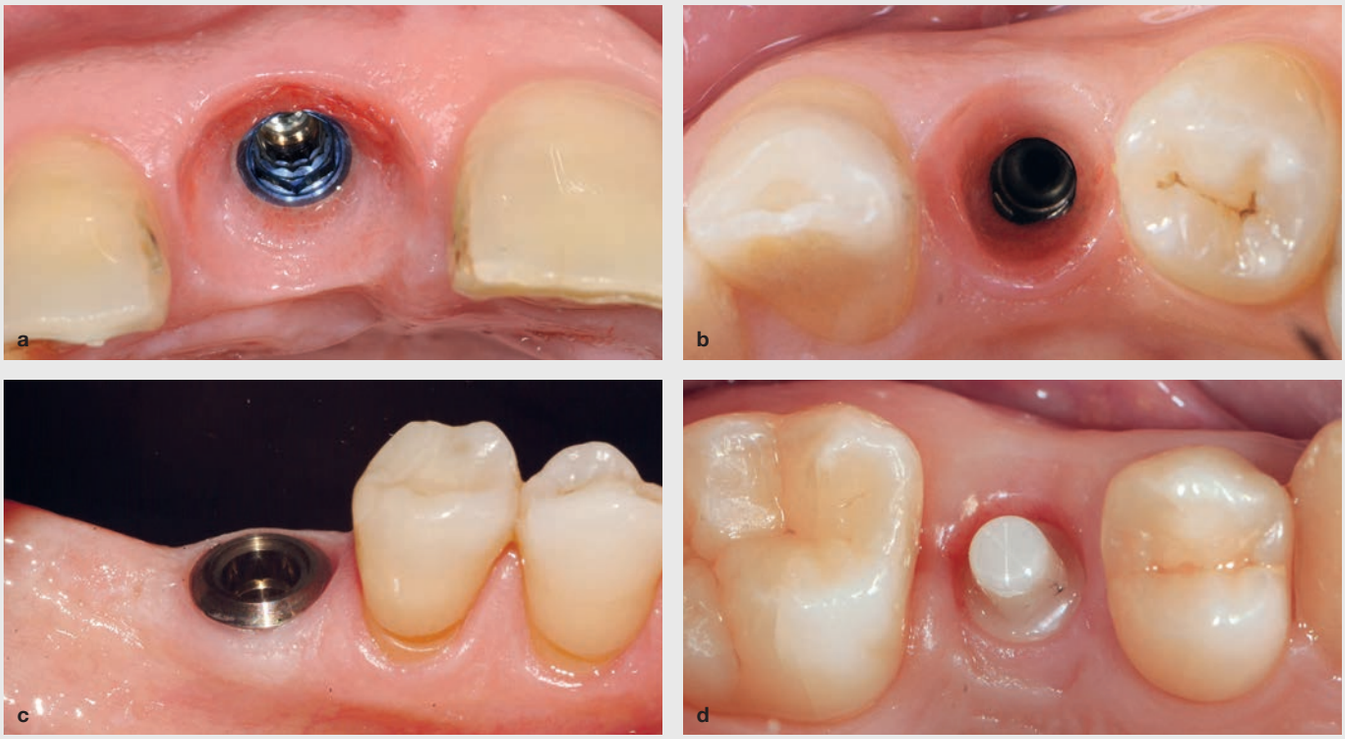


Fig 1-1 Physiologic appearance of peri-implant soft tissues around different implant types. *(a and b)* Bone-level titanium implants. In these cases the depth of the peri-implant mucosal tunnel, ie, the distance from the gingival margin to the implant connection, is greater. *(c)* Tissue-level titanium implant. In these cases the peri-implant mucosal tunnel is more shallow. *(d)* Single-component zirconia implant. With tissue-level implants, the implant prosthetic platform is located closer to the surface in a juxtagingival or slightly subgingival position.

2 How does soft tissue heal around an implant?

Formation of a transmucosal or peri-implant attachment begins with the implant placement for single-component implants (Fig 1-2). The epithelial cells at the margin of the surgical flap adapted to the implant or abutment neck proliferate and migrate to cover the underlying connective tissue and adhere to the implant or abutment surface, forming a junctional epithelium. Apical migration of the epithelial cells ends at a band characterized by dense connective tissue and located immediately above the bone ridge, which also comes into contact with the implant surface (Fig 1-3). For two-piece implants, formation of the peri-implant attachment begins at surgical reopening and abutment attachment (Fig 1-4).

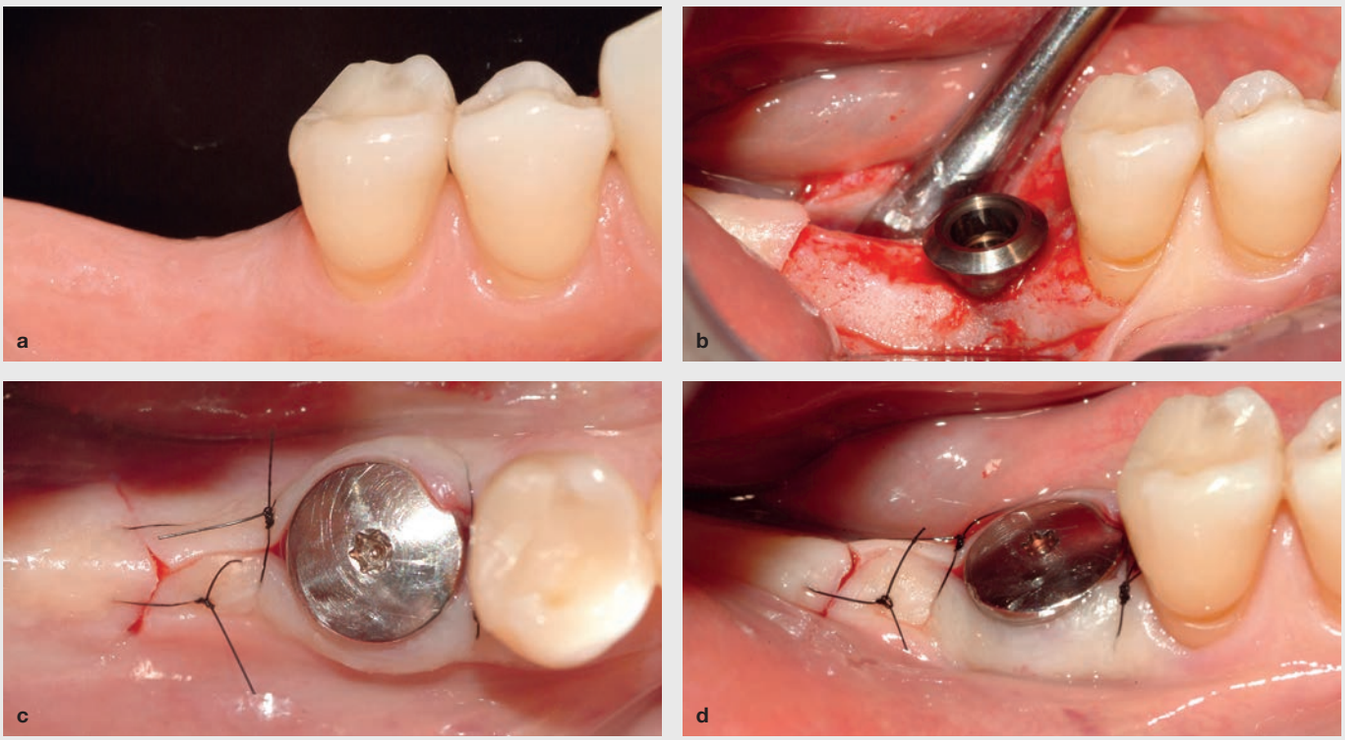


Fig 1-2 *(a to d)* The peri-implant mucosal seal around transgingival or single-component implants begins to form immediately after implant insertion, when the soft tissues are adjusted to fit the smooth implant neck by means of sutures.

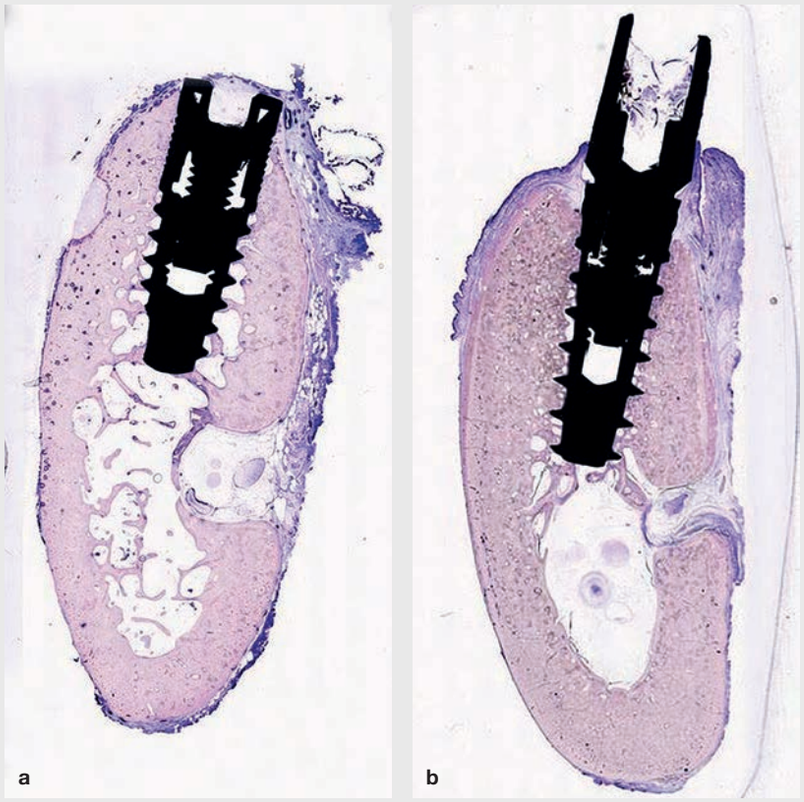


Fig 1-3 Histologic evaluation of peri-implant hard and soft tissue healing in a dog model 12 weeks after insertion. *(a)* With submerged healing, the implant achieves secondary stability through the osseointegration process. The soft tissues above the implant, consisting of epithelium and connective tissue, completely cover the head of the fixture. *(b)* After reopening and abutment connection, the soft tissues adapt around the abutment and heal by creating a mucosal tunnel consisting of an epithelial attachment and connective tissue attachment up to the first contact between bone and implant. (Courtesy of Prof J. L. Calvo Guirado, Murcia, Spain.)

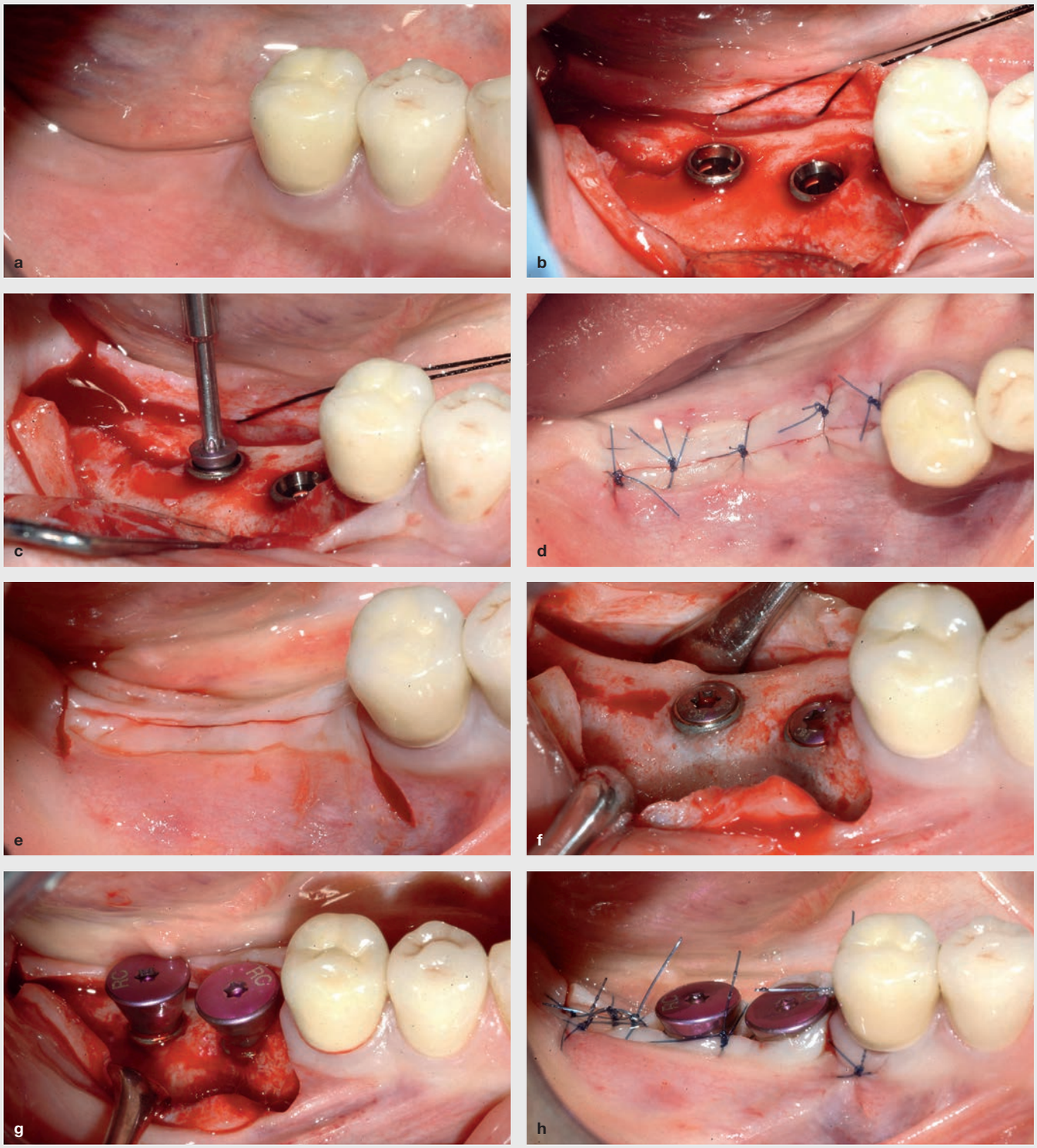


Fig 1-4 *(a to h)* For two-component bone-level implants, submerged healing is used, and the inner implant cavity is initially sealed by means of a surgical screw. On reopening, transmucosal healing screws are then positioned. In these cases, a peri-implant soft tissue seal is therefore formed after the second surgical stage.

3 What are the histologic characteristics of peri-implant soft tissues?

Various histologic studies on animal and human models[1–7] have allowed detailed description of the interface between soft tissues and titanium implants. This is characterized by:

- *Junctional epithelium:* Epithelial cells adhere to the implant surface through a basal lamina less than 200 nm thick through the formation of hemidesmosomes, as occurs with natural teeth. The apicocoronal extension of the junctional epithelium is 2 mm on average. Histologic examination of human biopsies has often detected the presence of an inflammatory infiltrate dominated by T lymphocytes below the junctional epithelium,[8,9] although in the absence of clinical signs of soft tissue inflammation and bone resorption. The composition of this inflammatory infiltrate, which acts as a physiologic barrier against external antigenic stimuli, is very similar to that present in periodontal soft tissues in natural teeth.
- *Supracrestal connective tissue:* The supracrestal connective tissue, which is approximately 1.5 mm high, seems to be the most important component of the peri-implant seal. The formation of this connective tissue layer (50 to 100 µm in thickness) adhering to the implant surface, which is packed with collagen fibers, is poorly vascularized, contains hardly any cells, and has characteristics similar to those of scar tissue, limits the apical migration of the overlying epithelium. Unlike the tooth connective tissue attachment, where the connective tissue fibers mainly grow at right angles to the root surface so they can insert into the root cement, peri-implant connective tissue fibers usually run parallel to the implant surface and can adopt a circular pattern. In the remaining connective tissue portion (excluding the layer adhering to the implant), connective tissue fibers run in different directions, and the cellular and vascular components are higher (Fig 1-5).

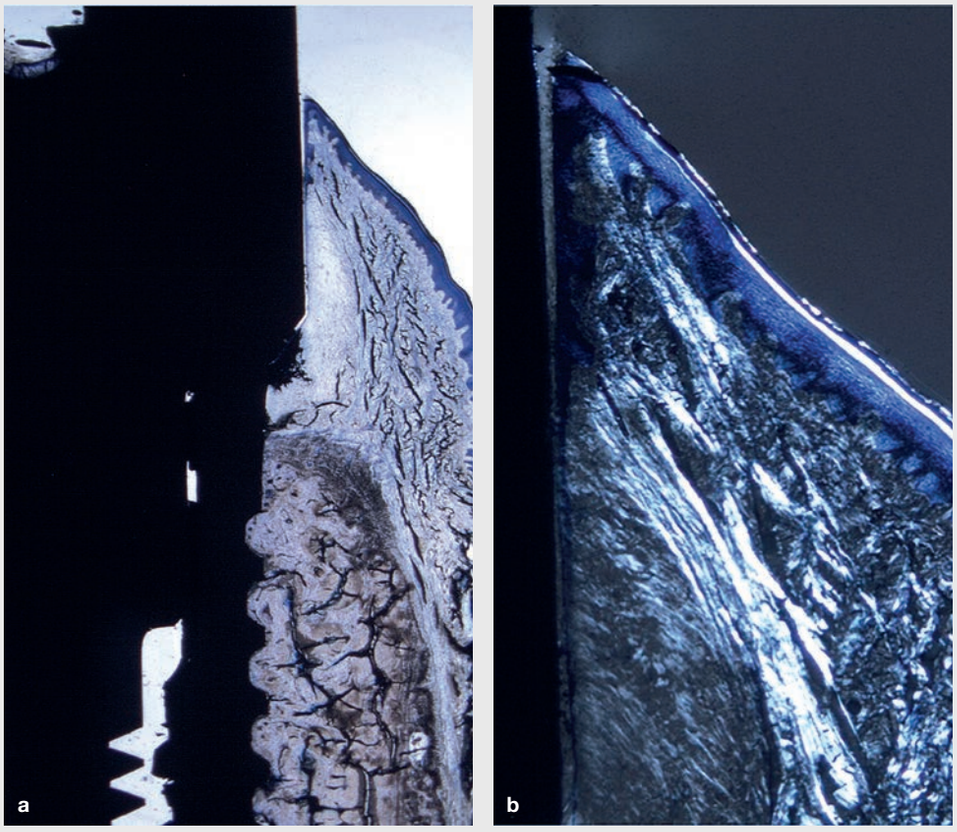


Fig 1-5 Histologic evaluation in a beagle model at the interface between the implant and supracrestal soft tissues 6 weeks after implant placement. *(a)* The junctional epithelium extends from the sulcus in an apical direction, where it is delimited by the connective tissue attachment, which ends apically at the point of first contact between bone and implant (original magnification ×10). *(b)* Polarized light clearly shows the direction of the collagen fibers within the supracrestal connective tissue and at the point of connective tissue attachment (original magnification ×40). (Courtesy of Prof G. Cardaropoli, Turin, Italy.)

4 What are the main differences between a natural tooth and an implant at the supracrestal level?

The soft tissues around implants and teeth is very similar and in both cases is more or less keratinized (depending on the presence or absence of keratinized gingiva). The subgingival interface between the soft tissues and the tooth or implant is represented by a junctional epithelium in the coronal component (approximately 2 mm wide) and supracrestal connective tissue in the apical direction (approximately 1 to 1.5 mm wide). In both cases, the connection with the junctional epithelium takes place through basal lamina and a layer of hemidesmosomes. In natural teeth, the apical limit of the junctional epithelium is the cementoenamel junction. In the soft tissue–implant interface, the epithelium stops about 1.5 mm short of the bone crest at the supracrestal connective tissue band. In natural teeth, the connective tissue fibers are predominantly horizontal and insert into the root cement (Fig 1-6).

Because implants lack a periodontal ligament, connective tissue fibers appear to originate from the bone crest periosteum, and their growth pattern is parallel to the implant surface. In the supracrestal area, the connective tissue seems to adhere closely to the thin layer of titanium oxide covering the implant surface. Connective tissue fibers growing with a circular pattern around the implant have been identified.

Peri-implant supracrestal connective tissue is richer in collagen fibers, but its cell population (fibroblasts) and vascularization are lower than those of natural teeth, having the properties of scar tissue. Any fibroblasts at this level perform the function of maintaining and, if necessary, restoring cohesion between the connective tissue and implant surface.

The lower vascularization of the implant connective tissue is explained by the fact that the natural teeth have a twofold source of vascularization, from the supraperiosteal vessels and the periodontal ligament vascular plexus, while the latter source is not present in implants. The connective tissue attachment and supracrestal connective tissue both perform a barrier function in natural teeth and implants. The early response to a buildup of bacterial plaque, ie, the composition of the inflammatory infiltrate and the type of lesions from a histologic viewpoint, is entirely similar in periodontal and peri-implant soft tissues (Fig 1-7).

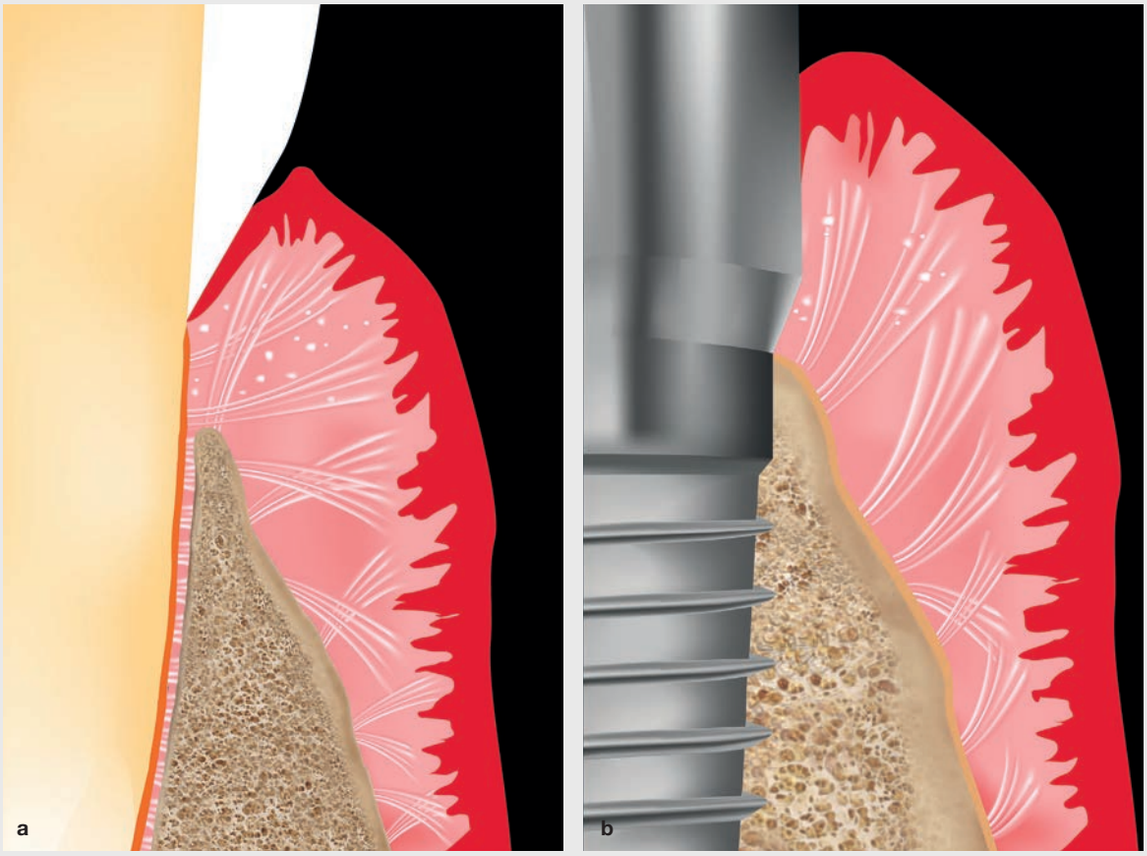


Fig 1-6 Illustrations of supracrestal tissues around a natural tooth *(a)* and a titanium implant *(b)*.

5 Is biologic width present around implants?

In natural teeth, the supracrestal soft tissues perform the function of protecting the periodontium (made up of root cementum, periodontal ligament, and alveolar bone) from external attack. From an anatomical viewpoint, supracrestal tissues consist of the sulcular epithelium, junctional epithelium, and connective tissue attachment. Together, the junctional epithelium and connective tissue attachment make up the biologic width, which tends to have constant dimensions.

There is evidence of the presence of soft tissue biologic width around osseointegrated implants (Figs 1-8 and 1-9). The average biologic width is approximately 3.0 to 3.5 mm, of which 2 mm is the junctional epithelium and about 1.0 to 1.5 mm is supracrestal connective tissue. In an experimental animal model[6] it has been shown that if supracrestal soft tissue thickness is reduced to less than 3 mm, the healing process will still tend to re-create a biologic width of 3 mm, which in this case will involve some bone ridge resorption, with the formation of an angular bony defect near the implant platform. Formation of this soft tissue band will subsequently protect the underlying bond between the implant and bone tissue, which is known as osseointegration. Whether the implant positioning involves one or two surgical stages does not seem to affect biologic width.[10,11] The type of implant system used (ie, two component, bone level versus single component, tissue level) does not appear to have any impact either.[12]

It can therefore be concluded that, as with the interface between soft tissues and natural teeth, a biologic width has been identified around implants (Fig 1-10). It measures approximately 3 mm and tends to be re-created by reduction of the bone ridge if the soft tissue height is insufficient.

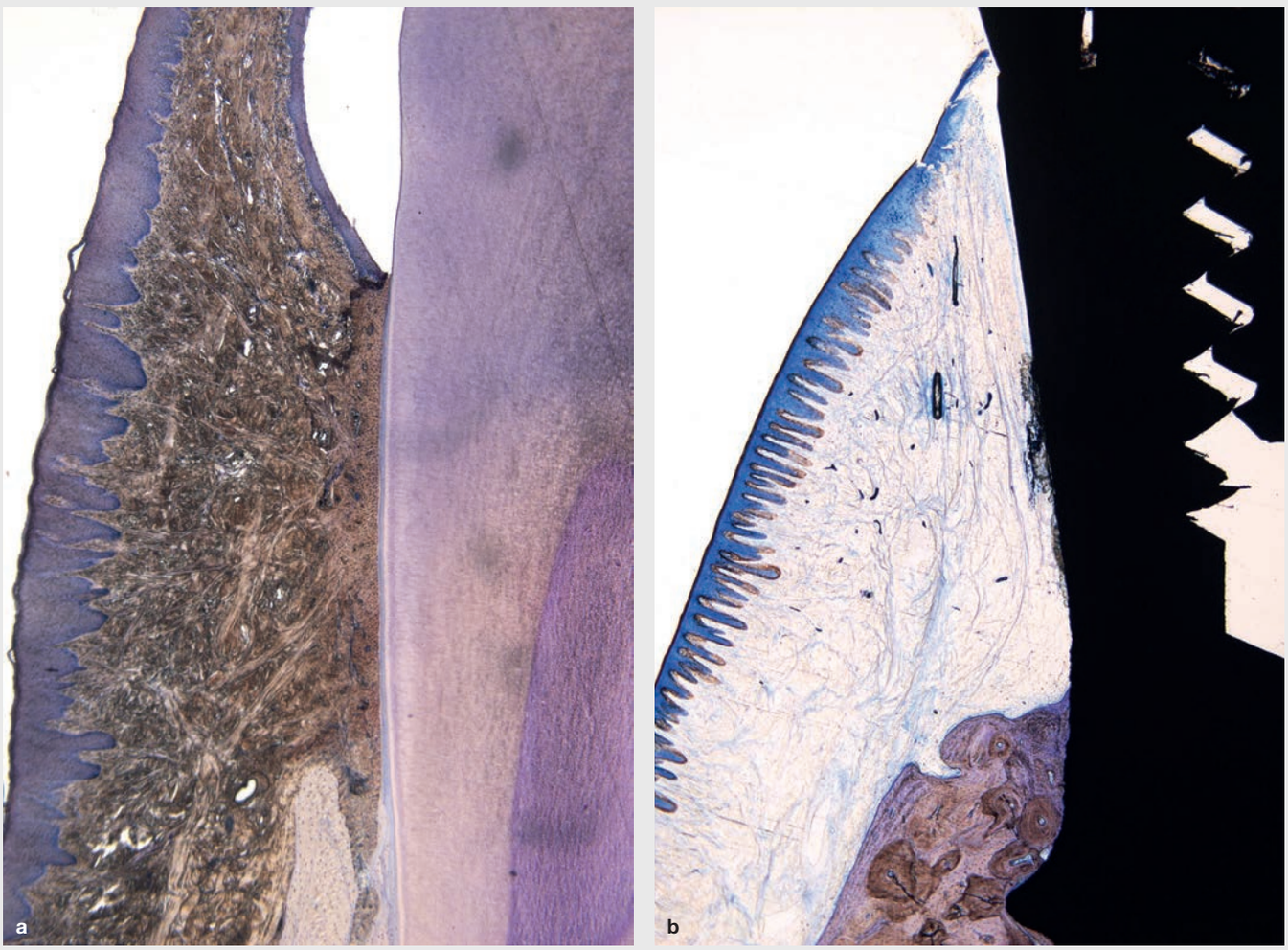


Fig 1-7 Histologic appearance of periodontal tissues around a natural tooth *(a)* and peri-implant soft tissues around a transmucosal single-component implant *(b)*. (Courtesy of Prof F. Schwarz, Frankfurt, Germany.)

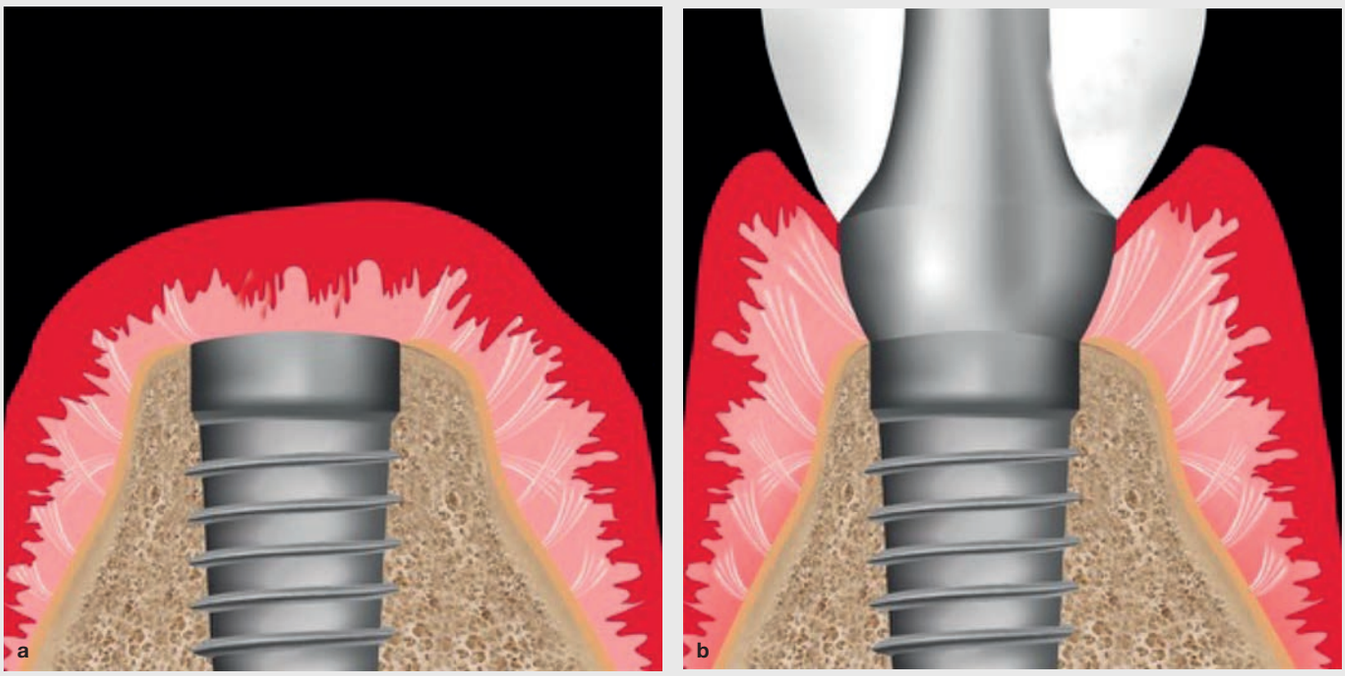


Fig 1-8 Biologic width is absent when the implant is still submerged *(a)*, forming after connection of the prosthetic components and loading *(b)*.

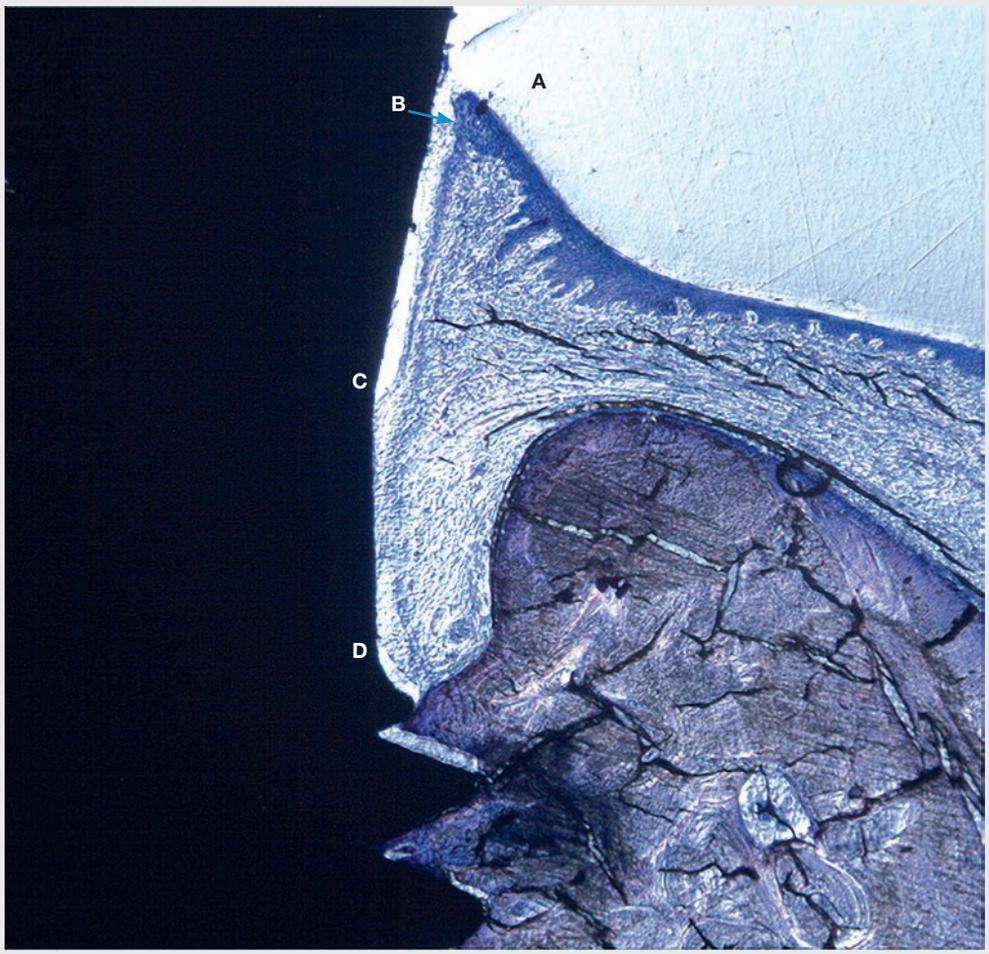


Fig 1-9 Histologic image of peri-implant soft tissues contributing to biologic width formation. The image shows oral epithelium (A), sulcular epithelium (B), epithelial attachment (C), and connective tissue attachment in the supracrestal portion (D). (Courtesy of Prof G. Cardaropoli, Turin, Italy.)

clinical case 1

Formation of a peri-implant mucosal seal around an implant positioned using a single-stage protocol

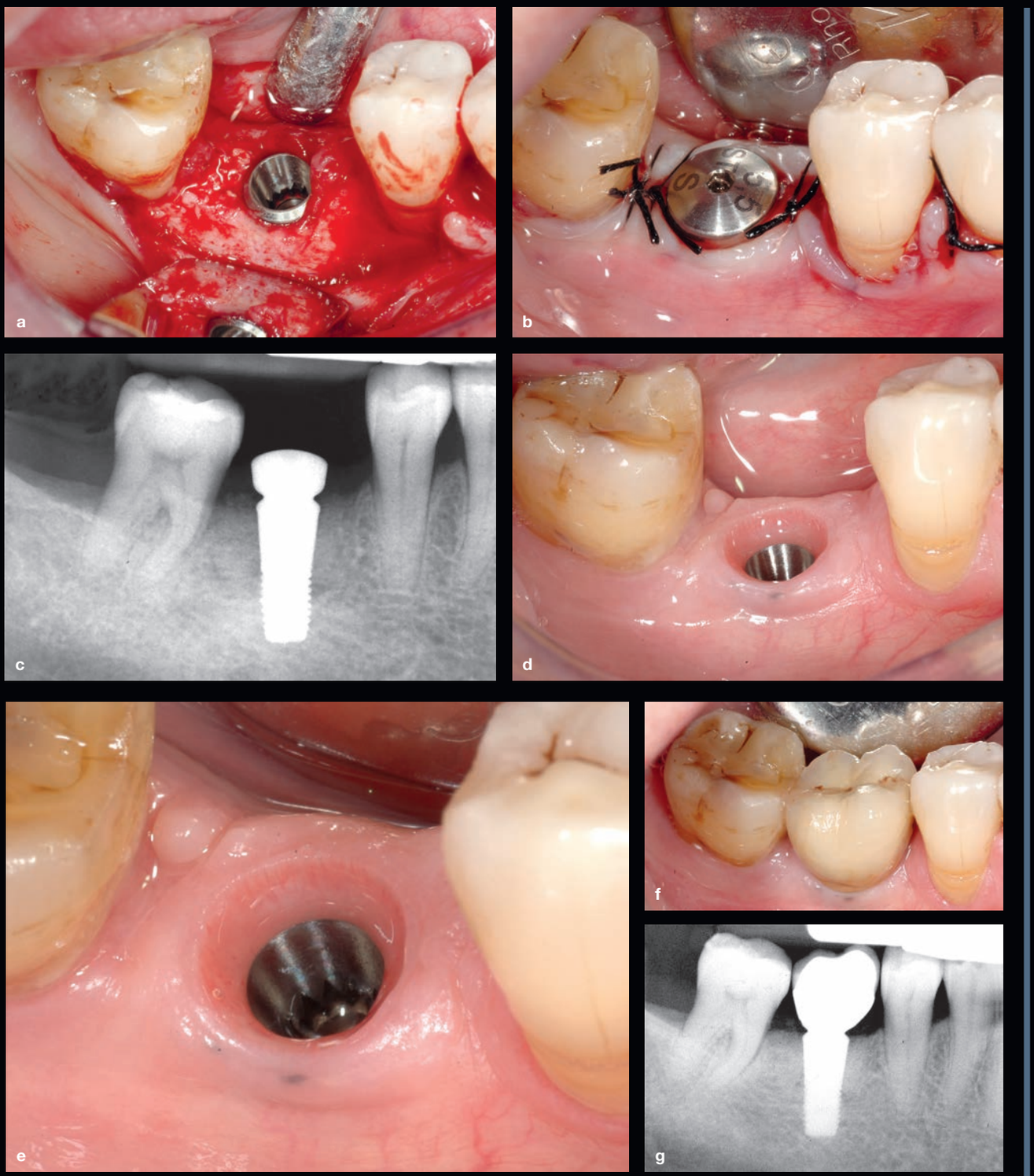


Fig 1-10 *(a)* A titanium implant is inserted at bone level in a mandibular first molar site by detaching a full-thickness flap. *(b)* A healing abutment is immediately screwed onto the implant head, and the soft tissues are fitted and sutured around it. *(c)* An intraoral radiograph shows the correct implant position in relation to the marginal bone level. *(d)* Twelve weeks later, after osseointegration, a newly created peri-implant mucosal seal is evident after removing the healing abutment. *(e)* Enlarged image of the peri-implant mucosal tunnel shows that these tissues are perfectly healthy, without any sign of superficial inflammation or bleeding. *(f)* Follow-up photograph 5 years after loading. Osseointegration of the implant and mucosal seal quality help to maintain the peri-implant tissues in perfect health with a sufficiently thick band of keratinized gingiva. *(g)* A radiograph taken 5 years after loading shows the stability of the marginal bone level.

clinical case 4 *(cont)*

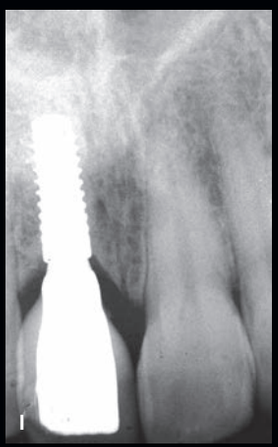
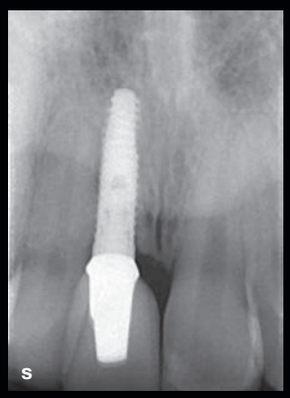


Fig 1-22 ***(cont)*** *(k to m)* Clinical and radiographic images after 5 years. The precise, stable implant-crown connection achieved through platform switching made it possible to maintain a stable peri-implant bone level. The stability of the soft tissue seal and profile can also be appreciated. *(n and o)* The ultimate goal of any prosthetic rehabilitation using implants must always be favorable integration of the implant-supported restoration with the surrounding tissues, smile, and the patient's facial appearance. (Implant surgery and prosthetic rehabilitation by Dr P. Casentini; prostheses by Mr A. Schoenenberger.)

clinical case 13 *(cont)*



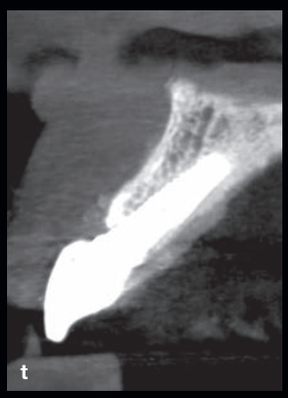
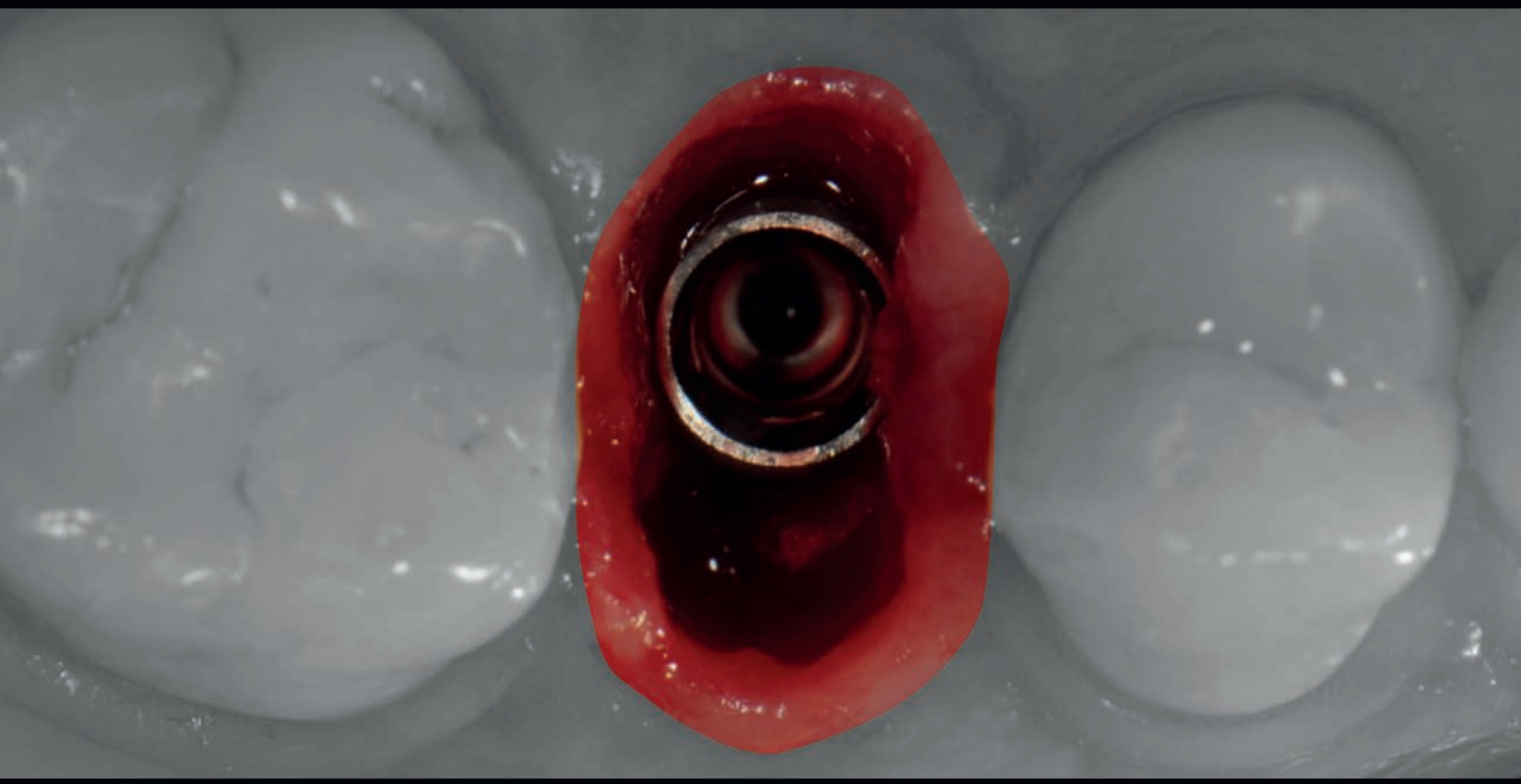


Fig 2-31 ***(cont)*** *(q and r)* Six months later, definitive rehabilitation was performed using a zirconia abutment and full-ceramic crown. Two porcelain veneers were applied to the maxillary right lateral incisor and left central incisor at the same time to achieve the best esthetic outcome. The clinical crown was lengthened on the right lateral incisor to harmonize the gingival profile. *(s)* A radiograph shows the marginal bone level 1 year after loading. *(t)* A 3D CBCT assessment, also performed 1 year after loading, shows regeneration of bone buccal to the implant. *(u)* The patient's smile is now well-proportioned and very pleasing esthetically.

three

Decision-Making Criteria in Socket Management After Extraction



clinical case 2

Multidisciplinary approach to ridge preservation for ankylosed maxillary central incisors

Fig 3-15 Ridge preservation technique for ankylosed maxillary central incisors using a multidisciplinary approach. *(a to d)* The maxillary central incisors were planned for extraction. The presence of noticeable asymmetry of the soft tissues between these and the adjacent teeth, caused by ankylosis of the central incisors, contraindicated immediate implant placement in the extraction socket. *(e to h)* In this case, the treatment plan involved preliminary orthodontic treatment with the aim of aligning both arches, increasing the mesiodistal space, improving the lateral incisor position, and aligning and intruding the mandibular incisors. The orthodontic treatment therefore required extraction of both maxillary central incisors, and ridge preservation was performed by inserting an osteoconductive biomaterial of bovine origin (Bio-Oss Collagen). Collagen sponges were used to seal the sockets after extraction.

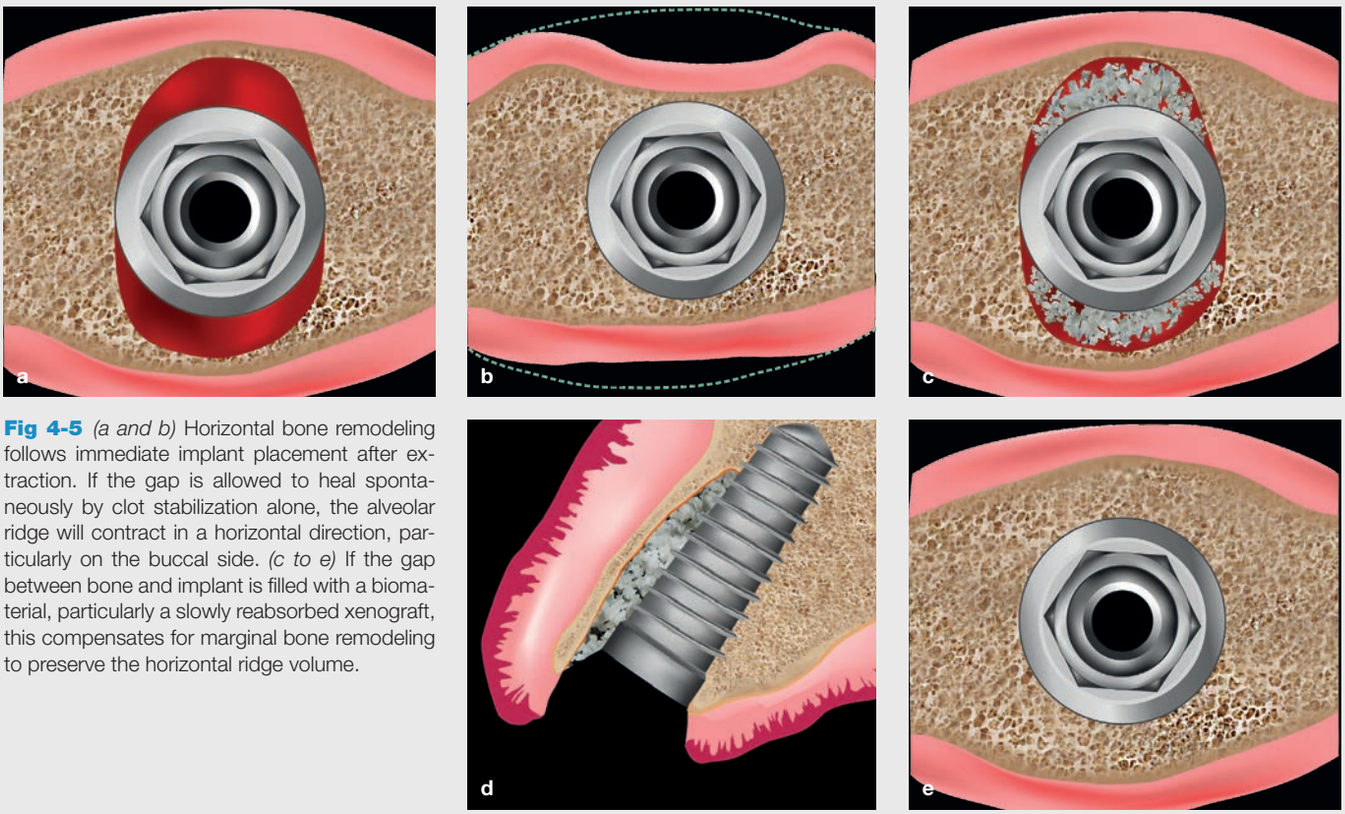


Fig 4-5 *(a and b)* Horizontal bone remodeling follows immediate implant placement after extraction. If the gap is allowed to heal spontaneously by clot stabilization alone, the alveolar ridge will contract in a horizontal direction, particularly on the buccal side. *(c to e)* If the gap between bone and implant is filled with a biomaterial, particularly a slowly reabsorbed xenograft, this compensates for marginal bone remodeling to preserve the horizontal ridge volume.

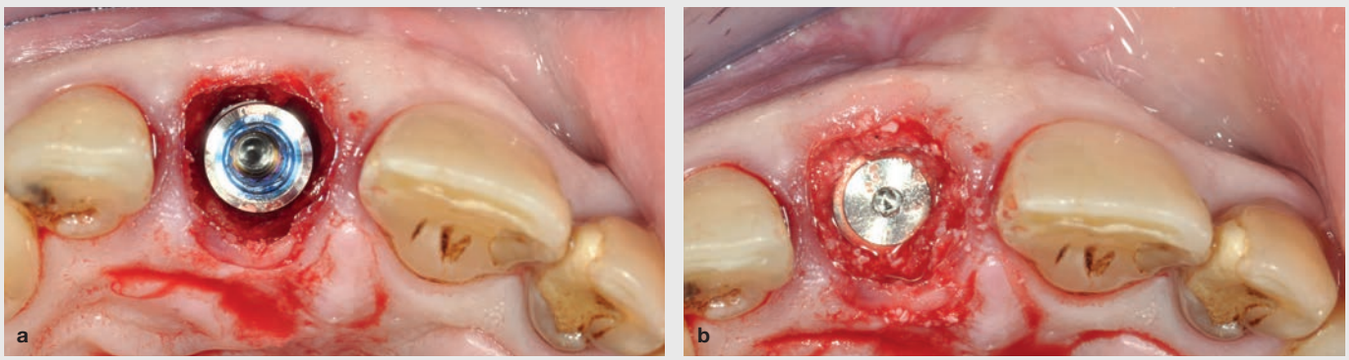


Fig 4-6 *(a and b)* After implant placement, the gap between the bone and the implant is filled to make up for remodeling of the socket walls after extraction.

Fig 4-7 *(a and b)* The gap between the implant and buccal cortical bone is filled with a collagenated form of DBBM (Bio-Oss Collagen, Geistlich) that facilitates biomaterial handling and packing into the gap.

clinical case 4 *(cont)*


ff


gg


hh


ii

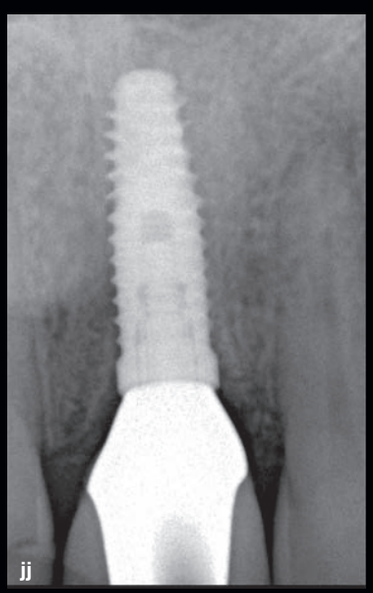

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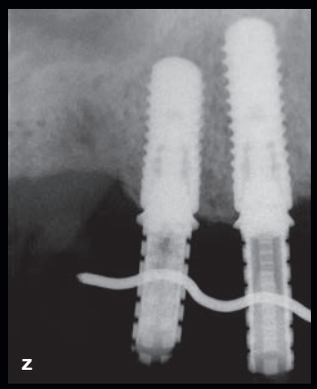
Fig 4-25 ***(cont)*** *(ff and gg)* TThe soft tissue anatomy is replicated using a custom impression transfer. This is used to prepare a zirconia abutment that will effectively support the soft tissues. *(hh to jj)* Follow-up carried out 12 months later shows that the prosthesis perfectly fits the soft tissues, which have maintained their initial vertical contour (papilla height and buccal profile) and horizontal contour (buccal thickness of the mucosa). Platform switching has minimized peri-implant bone remodeling, optimizing the marginal bone level 1 year later.

clinical case 10 *(cont)*


y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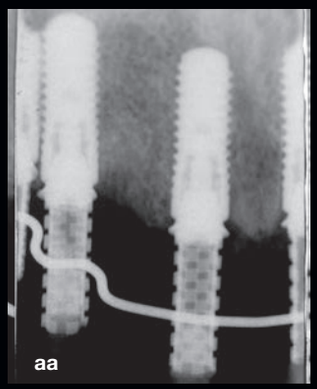
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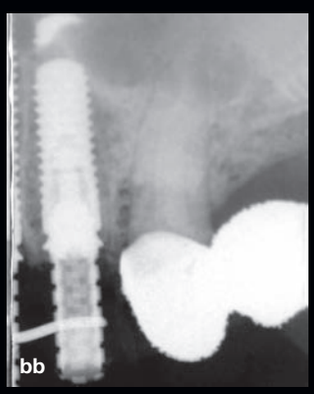
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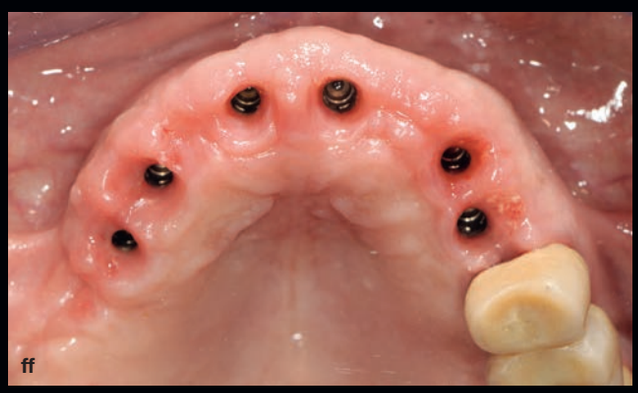

ff

Fig 4-31 ***(cont)*** *(y to cc)* Clinical and radiographic follow-up after positioning the provisional prosthesis 24 hours after implant surgery. The prosthetic load is distributed as evenly as possible, and the patient is advised to eat a soft diet during the first month of loading. *(dd)* The patient's smile after immediate loading of the prosthesis shows satisfactory restoration of the esthetic appearance. *(ee and ff)* After a 3-month period, implant osseointegration is confirmed, and the healed periimplant soft tissues are free of inflammation.

clinical case 4 *(cont)*

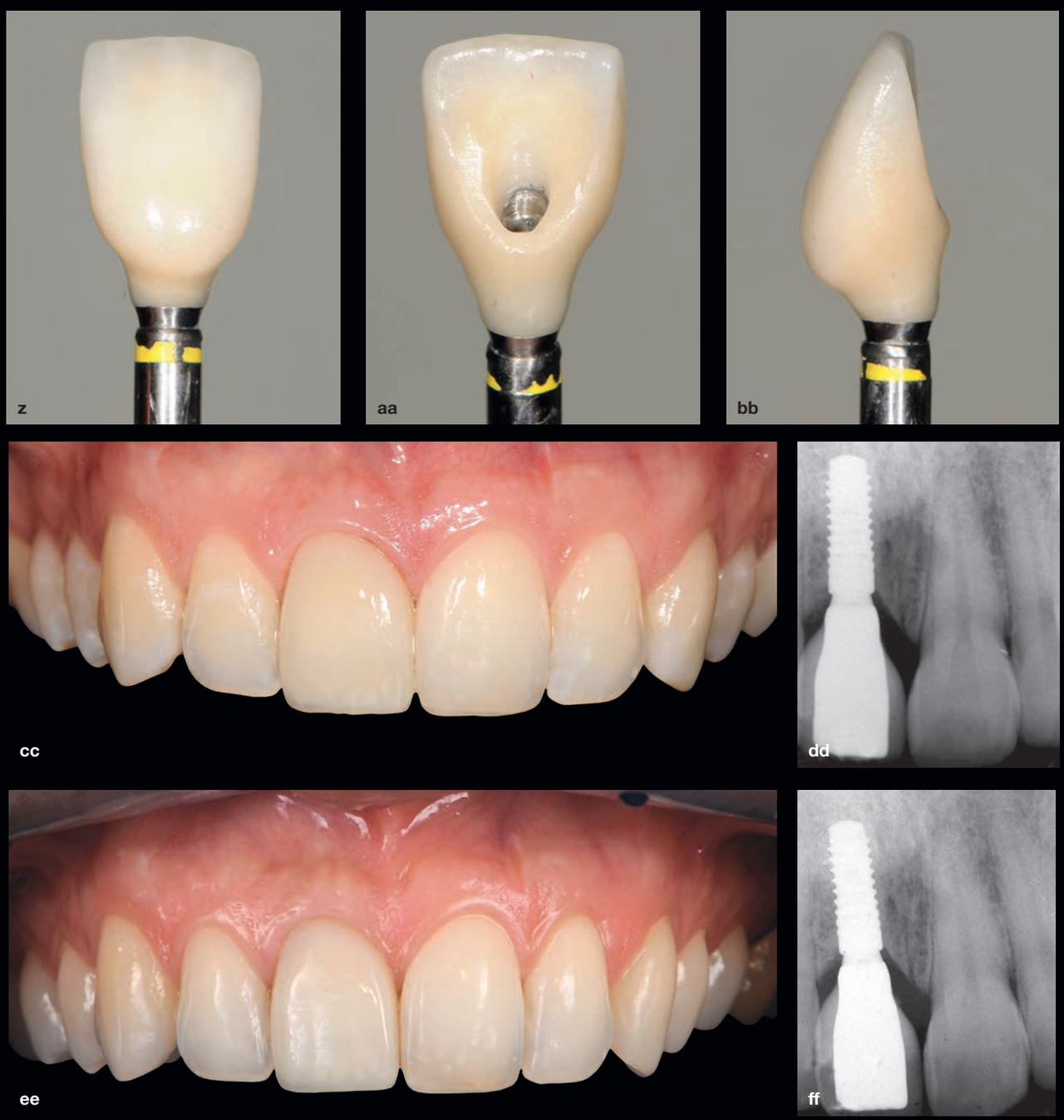


Fig 5-18 ***(cont)*** *(z to bb)* Note also the gradual emergence profile from the implant-prosthetic connection to the supragingival portion of the restoration by means of platform switching. With thin soft tissues, forming a harmonious emergence profile without steps and excessive tissue compression is considered an important factor for long-term stability of the soft tissue profile. *(cc)* Appearance of the implant-supported crown after delivery. The restoration appears to be well integrated into the surrounding soft tissues. The incisal margins form a convex line that is more pleasing than the original straight line, and the symmetric shape of the central incisors is favorable. *(dd)* A radiograph shows the marginal bone levels. (Surgery and prosthetic rehabilitation by Dr P. Casentini; laboratory stages by Mr A. Schoenenberger.) *(ee to ff)* The 5-year follow-up images show favorable medium-term prognosis of this implant-supported prosthetic rehabilitation and the stability of hard and soft tissues. →

clinical case 4 *(cont)*

Fig 5-18 ***(cont)*** *(gg to ii)* This implant-supported prosthetic rehabilitation provides excellent integration with the surrounding soft tissues and the patient's smile.

Questions:

1. What is meant by gingival recession?
2. What are the main etiologic factors in the development of gingival recession?
3. Apart from the main causal factors, what predisposing factors have been identified for gingival recession?
4. What are the therapeutic options for treating gingival recession?
5. Is it possible to predict the potential outcome of root coverage using periodontal plastic surgery tehniques?
6. What are the main periodontal plastic surgery procedures?
7. What techniques are used to harvest gingival tissue during periodontal plastic surgery?
8. Can biomaterials be used to replace connective tissue?
9. Given current scientific findings and the techniques described previously, what treatment guidelines can be suggested for different recession types?

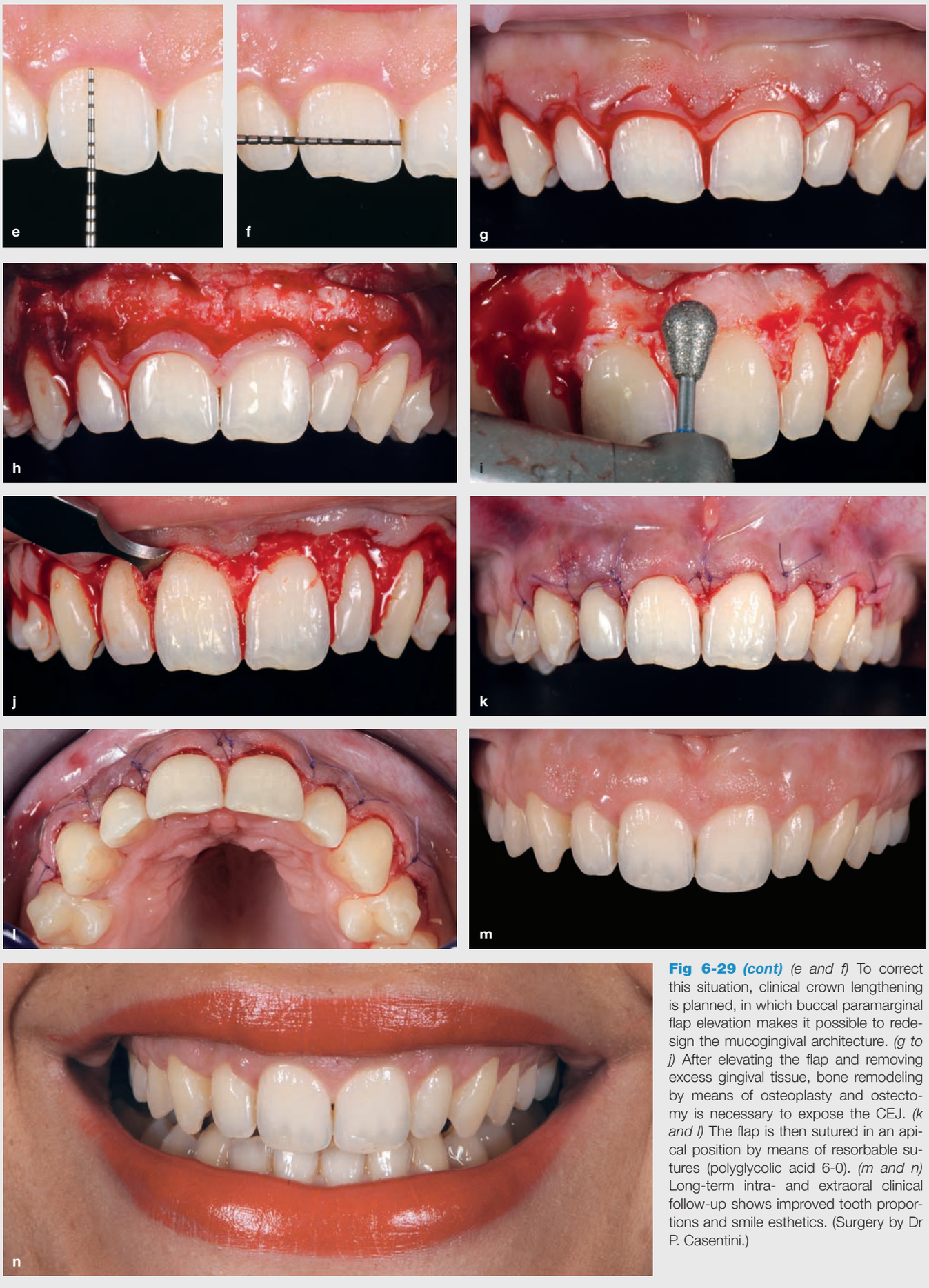


Fig 6-29 ***(cont)*** *(e and f)* To correct this situation, clinical crown lengthening is planned, in which buccal paramarginal flap elevation makes it possible to redesign the mucogingival architecture. *(g to j)* After elevating the flap and removing excess gingival tissue, bone remodeling by means of osteoplasty and ostectomy is necessary to expose the CEJ. *(k and l)* The flap is then sutured in an apical position by means of resorbable sutures (polyglycolic acid 6-0). *(m and n)* Long-term intra- and extraoral clinical follow-up shows improved tooth proportions and smile esthetics. (Surgery by Dr P. Casentini.)

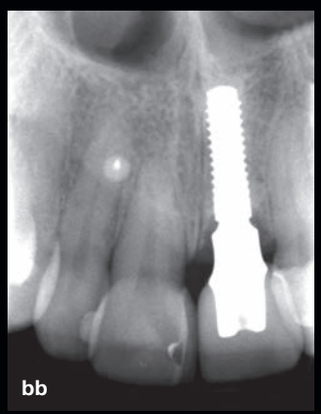
clinical case 8

Ridge preservation combined with tunneling technique and tissue grafting in a case with high esthetic impact

Fig 6-48 *(a)* This 42-year-old woman has high esthetic expectations and says she is very dissatisfied with the appearance of her smile. She also reports discomfort in the anterior maxilla. Her smile line, which may be classified as middle to high, shows asymmetry. *(b)* At the intraoral level, a frontal view reveals asymmetry between the central and lateral incisors. The contralateral teeth have different clinical crown lengths, and volume loss and retraction of the papilla between the left central and lateral incisors are also evident. The left central incisor has undergone multiple reconstructive and endodontic treatments and is very mobile. The left lateral incisor has been treated with a provisional crown. Gingival recession is also present at the right central incisor. *(c and d)* The radiograph and computed tomography scan also reveal complete loss of the buccal cortical bone around the left central incisor and partial loss of the bone peak between the left central and lateral incisors. To improve the harmonious proportions of the maxillary anterior teeth, it is necessary to realign the gingival margins, improve the alignment of the incisal margins and the tooth axes, redistribute the mesiodistal spaces (the left lateral incisor looks bulkier than the right lateral incisor), and improve tooth color, which does not look uniform. *(e)* The left central incisor is considered compromised and is planned for extraction. The main risk attached to extracting a tooth with complete buccal cortical bone loss and a thin, scalloped biotype is severe soft tissue collapse with further compromise of the bone peaks and soft tissue recession around adjacent teeth. For this reason, it is decided to carry out a series of corrective maneuvers to prevent this risk of collapse. First, a provisional prosthesis will be prepared for the left lateral incisor with a pontic for the central incisor to ensure the patient sufficient comfort with a fixed provisional prosthesis. Then, the left central incisor will be extracted with careful removal of inflammatory tissue. A simultaneous flapless extraction site preservation technique will be implemented. Although flap elevation is the treatment of choice when cortical bone is completely lost because of the high risk of tissue collapse, flap detachment is contraindicated in this case. In addition, a mucogingival tunneling procedure will be performed at the left lateral incisor at the same stage to improve the shape and volume of the soft tissues around this tooth and make it more symmetric with the right lateral incisor. A few months later, an implant will be inserted in the left central incisor site, most likely combined with a regenerative technique because the ridge preservation technique has not been carried out under ideal conditions. On this occasion, it will also be possible to treat the gingival recession at the right central incisor. Provisional prosthetic treatment will then be carried out to condition the peri-implant soft tissues. The rehabilitation will be concluded with definitive restorations at the implant site and on the left lateral incisor and an additive veneer on the right central incisor, with the intention of improving most of the esthetic parameters.

clinical case 8 *(cont)*

aa



bb

cc

Fig 6-48 ***(cont)*** *(aa)* The right central incisor received a mesial additive veneer in feldspathic ceramic to harmonize the shapes of the two central incisors, redistributing the available mesiodistal space. The clinical follow-up shows good esthetic integration of the restorations with the surrounding hard and soft tissues. *(bb)* The radiograph shows well-adapted restorations and the absence of peri-implant bone resorption. (Surgery by Dr P. Casentini and Prof M. Chiapasco; prosthetic rehabilitation by Dr P. Casentini; laboratory procedures by Mr A. Schoenenberger.) *(cc and dd)* The posttreatment situation shows a significant improvement in soft tissue architecture, restoration of appropriate morphologic and color symmetry, and a distinct improvement in the esthetic appearance of the smile, which is well integrated in the patient's face.

dd

clinical case 3 *(cont)*

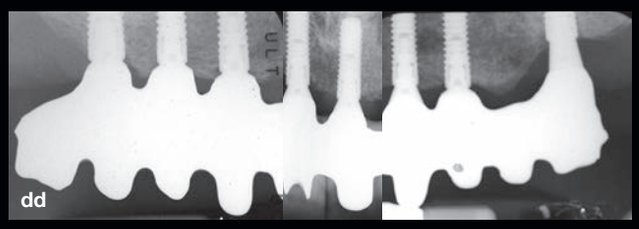


Fig 7-12 ***(cont)*** *(z)* Definitive zirconia-ceramic screw-retained fixed prosthesis prior to delivery. The prosthesis is screw-retained to intermediate abutments (Multi-Base, Straumann), which in turn are tightened to the implants. Despite the impressive bone reconstruction achieved, the prosthesis needs to include a certain amount of pink ceramic to achieve full esthetic and functional restoration and support the perioral soft tissues satisfactorily. (Preparation of prostheses by Mr R. Colli and Mr C. Pedrinazzi.) *(aa and bb)* Occlusal views before and after delivery of the definitive prosthesis, demonstrating successful reconstruction of a broad band of peri-implant keratinized tissue. *(cc to ee)* Clinical and radiographic follow-up showing that the definitive prosthetic reconstruction allows full esthetic and functional recovery and is well integrated into the surrounding soft and hard tissues. (Prosthetic rehabilitation by Dr P. Casentini.)

clinical case 1 *(cont)*

Fig 9-8 ***(cont)*** *(s and t)* The definitive all-ceramic crown. *(u and v)* Once cemented in place, the definitive crown effectively supports the interdental papillae and the buccal soft tissue. *(w and x)* Clinical images after 1 year show tissue stability. *(y)* A radiograph reveals a stable mesial and distal marginal bone level.

Questions:

1. What are the characteristics of orthodontic movement, and what is its role in multidisciplinary treatment plans?
2. In what clinical situations and time frames can orthodontic therapy be used to develop an implant site?
3. What are the options for managing tooth agenesis in the esthetic zone?

clinical case 5 *(cont)*

bb

cc

dd

ee

ff

gg

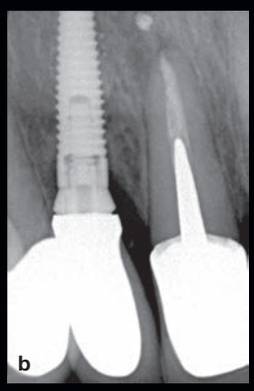
Fig 10-20 ***(cont)*** *(bb to gg)* Comparison between the initial clinical situation and the posttreatment situation shows the considerable improvement achieved and the correction of anomalies and imperfections.

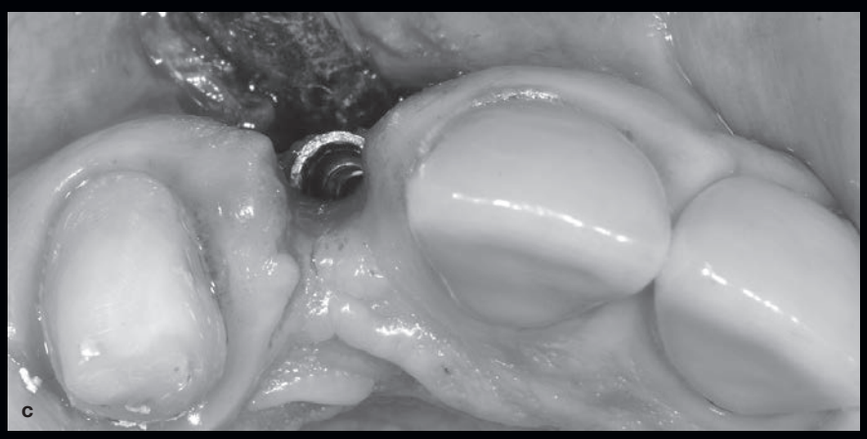
clinical case 4 *(cont)*

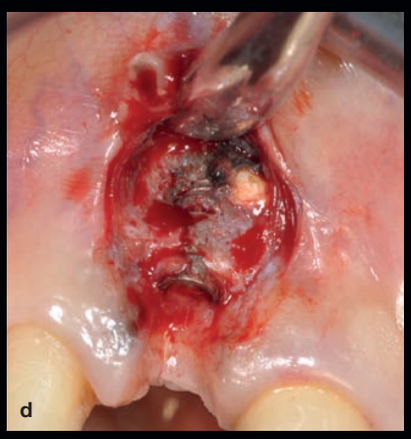
Fig 11-16 ***(cont)*** *(ll to oo)* Definitive metal-ceramic restorations prior to placement. *(pp to tt)* Intra- and extraoral views after placement of the definitive crowns show successful esthetic integration of the prosthetic rehabilitation, and long-term radiographic follow-up shows a stable peri-implant bone level. (Mucogingival surgery and prosthetic rehabilitation by Dr P. Casentini; prosthetic devices by Mr A. Schoenenberger.)

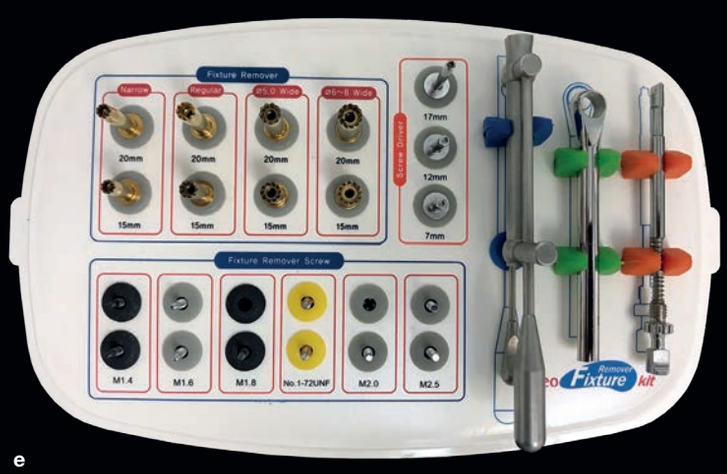
clinical case 9

Removal of an implant improperly positioned in the esthetic zone using a universal implant removal kit followed by prosthetically guided replacement









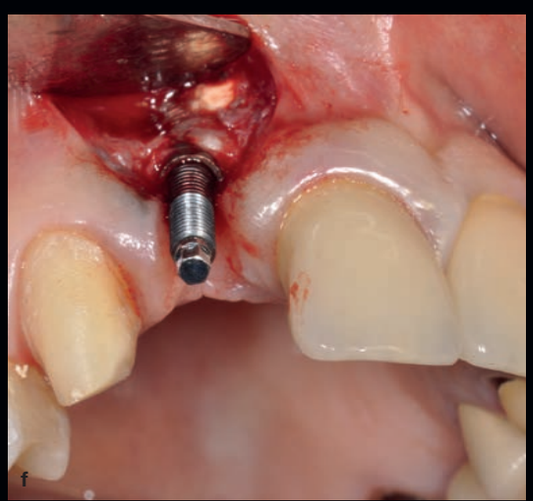


Fig 11-21 *(a and b)* The initial clinical situation reveals esthetic failure of implant treatment at the maxillary right lateral incisor site. The patient has undergone immediate postextraction implant placement in an area showing discoloration due to a previous apicoectomy. Implant placement was overly buccal, resulting in soft tissue recession compensated for esthetically by lengthening the metal-ceramic restoration. Given the unfavorable implant position, it is not considered recoverable, and its removal is planned in combination with soft tissue augmentation, placement of a new implant, and GBR. *(c)* An occlusal view with an open flap confirms the overly buccal implant position. *(d)* Raising the flap also reveals lack of buccal cortical bone, exposure of the implant threads, and the presence of silver amalgam residues left over from the previous apicoectomy. *(e)* Special universal kits (Fixture Removal Kit, Neobiotech) are currently available for atraumatic removal of osseointegrated implants. The basic principle is that an initial screw is selected based on implant size, placed in the implant, and tightened clockwise. The implant extractor is then screwed counterclockwise onto the first screw. A torque wrench capable of high torque (up to 200 Ncm) can then be used to unscrew the implant in a counterclockwise direction. *(f)* The initial screw is tightened clockwise.

clinical case 12 *(cont)*

Fig 11-24 ***(cont)*** *(n and o)* The appearance of the completed rehabilitation shows satisfactory integration with the surrounding tissues and good biomimetic integration with no sign of the pink porcelain. The patient is given proper training in the daily use of Super Floss (Oral-B) for oral hygiene at home because of the additional pink resin. (Prosthetic rehabilitation: Dr P. Casentini; prosthetic devices by Mr C. Pedrinazzi and Mr R. Colli.) *(p to u)* Clinical and radiographic follow-up after 7 years shows a stable outcome. The prosthetic restoration is well integrated with the surrounding tissues, and the patient's smile is pleasing, confirming the pretreatment assumption of a high smile line.